Ticket : OG_S5_06 (With L4 Mappings)

Deploy OGC Web Services

Launch Criticality: SY5

Review: DPL, HEG, BMGT

NCR No: N/A

Number of Tracked Ticket Changes:
3

Ticket CCR Number[*]: 04-0649

Ticket CCR Date[*]: 11/29/2004

* Represents changes to information from Ticket table only. Does not include information linked in from other tables.

NOTE: The number of tracked changes (above) represents the number of changes to this particular Ticket. Whenever the data appearing in this Ticket changes this number is incremented by 1.

External Interface Dependency:
ESG, ECHO

Subsystem Dependency:
DPL, HEG, BMGT, Bulk URL Utility, OGC-ECHO adaptor (OEA)

Preconditions:

- All WCS, WMS and CPS Vendor licenses must be installed on the target platform
- All data that are identified to be served by the WMS must be configured in the Datapool database.
- All data that are identified to be served by the WCS must be configured in the Datapool database.
- All pre-existing data that is identified to be served through W*S servers must be transitioned. This could simply be achieved by,

   Tagging your legacy data.

   Opening up the temporal constraint on the conversion utility to catch the legacy data's insert range.

Differences from Previous Releases:

This ticket deals with the specification of the evolution of the Synergy FY2003 Earth Science Gateway (ESG) Support Component Prototype Pilot. That evolution moves from a prototypical 'proof of concept' iteration to a fully functional deployment of OGC web services bound by the constraints of a limited inventory exposure. This Synergy FY2004 iteration is referred to as a 'pre-operational deployment'.

The Synergy FY2003 iteration focused on the delivery of 3 primary web services that defined the 'nature of service',

1. Web Coverage Service (WCS)
2. Coverage Portrayal Service (CPS) used in conjunction with any (local or distributed) WCS and styling to provide the service described in (3)
3. Web Mapping Service (WMS)

The 'level of service' for Synergy FY2003 was limited to that needed to prove the concept of OGC Web Services for EOS Datapools. By this it is meant that only a very small inventory was used. Furthermore, this inventory was tightly-coupled to the system.

For details of the Synergy FY2003 effort, see ticket WD_S4_06.

The pre-operational deployment of OGC Web Services for Synergy FY2004 will provide the same nature of service as in FY2003. The level of service, however, will be increased substantially. Furthermore, a framework will be provided to combat the following operational concerns,

1. Scaling the OWS inventory to operational levels. (up to 50000 pieces of ECS inventory)
2. Handling the volatility of the OWS inventory. (no more than 2% of daily ECS Datapools volatility). The term volatility refers to the insertion and cleanup of inventory only.
3. Meeting performance demands related to import of inventory and access of that inventory to the end user.

The 'Deployment of OGC Web Services' (DOWS) for Synergy FY2004 will allow OGC-compliant clients the ability to search, map, download, and subset (spatially and temporally) data residing in the EOS Data Pools.

The DOWS will be a combination of custom code and third party vendor product integration, leveraging on the products developed in partnership with IONIC in Synergy FY2003.

The DOWS deployment will include hardware upgrades to NASA selected DAACs, in order to accommodate special demonstration data sets. The DAAC will be responsible for managing storage associated with the OWS inventory.

Operations Concept:

Raytheon will provide a mechanism that will allow a configurable, subset of EOS Data Pools inventory to be accessed via the following Open Geospatial Consortium (OGC) Web Services (OWS),

    a. Web Coverage Service (WCS)
    b. Web Mapping Service (WMS)

In order to support the basic functions of a WMS, WCS, on top of the selected inventory within EOS Data Pools, the following operational threads are envisioned:

1. Data Enabling

The existing data pool themes concept allows operators to group arbitrary collections of granules by metadata constraints that can be defined by the operator via a subscription that is associated to that theme for new data. For this release, the collection of granules would be bound by a specific ECS Earth Science Data Type (ESDT). For existing data, the metadata constraints have to be applied via a manual query that selects the existing granules to be inserted. The Batch Insert Utility allows us to specify a theme to associate to a group of granules. These constraints may define a notion as complex as the geospatial and temporal extent of a natural disaster or as simple as a particular ESDT. Each 'OWS theme' will map to either a WCS Coverage Offering and/or a WMS layer. Each granule contained in that theme will also map to a WCS Coverage Offering and/or a WMS layer.

The themes mechanism could allow us to,

- Earmark arbitrary collections of granules for a particular instance of a web service in the form of an 'OWS theme'.
- Easily create and destroy these OWS themes.
- Easily add or remove granules from these OWS themes.
- Be able to identify OWS themes by bounding metadata. For example, defining an OWS theme by a certain spatial or temporal constraint.

This mechanism can be exploited as a means of describing OWS-enabled inventory. However, the use of themes, in this manner, will have an impact on the existing datapool drilldown capability.

A mechanism would need to be introduced that could differentiate from drilldown and OWS themes and augment the drilldown capability appropriately.

The Data Pool Maintenance GUI is the current mechanism for handling the creation of data pool drilldown themes. The ECS Spatial Subscription Server handles the population of those themes with inventory. Using the same operational concept, an analogous OWS theme concept can be created.

The creation of an OWS theme via the Spatial Subscription Server will tag data inserted into the datapool inventory, via the data pool database. This tagging will render a piece of inventory OWS-enabled. It is via this tagging that the remaining aspects of DOWS can be achieved.

2. Data Conversion

The EOS Datapools represents a subset of a DAAC's EOS inventory. That inventory is stored in the hdf-eos format. This format is not widely used in the OGC community. The preferred format is GeoTIFF.

Our third-party W*S applications are able to apply this conversion at runtime. The process, however, can take an amount of time incompatible with a synchronous service. To increase performance of the services it would be useful to pre-convert as much data to GeoTIFF format as possible, but, due to resource constraints at an operational DAAC, a balance must be struck between storage and performance limits. The volume of data generated by the 'pre-convert' strategy 'in-extremis' limits its' usefulness.

It is envisaged that a useful subset of the OWS-enabled inventory be pre-converted to GeoTIFF. This pre-conversion will be carried out by a custom application.

Those OWS-enabled data that are not pre-converted to GeoTIFF will be subject to on-the-fly conversion by our third-party W*S applications if requested by a user. The vendor will provide a caching mechanism for the efficient management of requests requiring 'on-the-fly' conversion.

The pre-conversion of a single hdf-eos file will result in the generation of one or more, GeoTIFF files. These files will be placed in the same directory as the 'parent' hdf-eos file, within the Datapool cache. The physical location of all GeoTIFFs will also be stored in the Datapool database.

As a consequence of storing the generated GeoTIFF locations in the datapool database leverage on the existing Data Pool Cleanup utility for housekeeping can be achieved. When a piece of native (hdf-eos) inventory expires, it along with its child GeoTIFF files will be cleaned up when the Data Pool Cleanup utility is run.

Only a subset of the GeoTIFFs that can be created from a single hdf-eos file are of relevance to our OWS applications. This subset will be the only GeoTIFF data stored in the Datapool for a given hdf-eos file.

The subset, if any, of the GeoTIFFs that can be created from a single hdf-eos file will be determined on a per-ESDT basis by the DAAC and reflected in the configuration of the DOWS.

The 'pre-convert' process will be executed on a regular basis in conjunction with the 'data exposure' operational thread.

3. Data Exposure

Data exposure is primarily handled by third party applications. In order to expose OWS-enabled data to the end user via those W*S applications the data must be 'indexed'. Indexing involves the replication of metadata pertaining to the OWS-enabled inventory from the Datapool database to the W*S applications' database. Due to the volatility of the datapool inventory the provision for both addition and removal of OWS-enabled inventory from the W*S application's database must be provided.

The extent of metadata that will be replicated depends on the number of searchable criteria you want to expose to the end user. Examples of metadata to be conveyed are,

- Physical location of data
- Geospatial extent
- Temporal extent

Additional metadata should be indexed per piece of OWS-enabled inventory if necessary. The following metadata would be required,

- ECS Granule Id
- Cloud Cover

Others could be added as needed.

The data exposure operational thread will be responsible for maintaining a subset of the datapool database that is current. Any changes in the subset of OWS-enabled inventory within the datapool must be propagated to the indexer. As a consequence this activity could be viewed as a 'synchronization' process.

The synchronization process will be executed on a regular basis due to the potential volatility of the datapool inventory. The synchronization process will involve the synchronization of both WCS and WMS inventory between the Data Pool database and the indexer. Correctly exposed inventory will be tagged within the Data Pool database so that it can be published via the Data Publishing operational thread.

Specifications levied on the W*S application from third party vendors that are not covered by explicit requirements in this ticket are as follows,

1. The OWS Vendor shall provide a OGC Web Coverage Server that complies to version 1.0 of the OGC Web Coverage Service specification
2. The OWS Vendor shall provide a OGC Web Mapping Server that complies to version 1.1.1 of the OGC Web Mapping Service specification
3. The OWS Vendor shall provide OWS support for 10 new data types. (Provide cost per additional data type above this level)
4. The OWS Vendor shall provide backwards compatibility to WCS 1.0 in any OWS product they supply.

5. The OWS Vendor shall provide backwards compatibility to WMS 1.1.1 in any OWS product they supply.
6. The OWS Vendor shall be able to scale support up to 50000 pieces of inventory (granules).
7. The OWS Vendor shall be able to deploy up to 4 independent instances on a single host.
8. The OWS Vendor shall be able to support multiple versions of web services on the same host.
9. The OWS Vendor shall provide a system that will be operationally stable for a period of 10 days.
10. The OWS Vendor shall provide a system that will be operationally stable whilst inserting and deleting inventory at a rate of 5000 daily.
11. The OWS Vendor shall provide a system that will provide client visibility to new inventory at a rate of 5 updates per second.
12. The OWS Vendor shall implement security procedures consistent with the existing DAAC policies.
13. The OWS Vendor shall support the following services on supported data types and as supported by HEG:
    a. Format conversion
    b. Spatial subsetting
    c. Varying output resolution
    d. Re-projections contained in WGS84
    e. As a stretch goal temporal subsetting
       Note: there will be no requirements to do HEG stitching. All stitching will involve geotiff stitching within the IONIC application.

14. The OWS Vendor shall supply a test client free of cost for the duration of the period of performance
15. The OWS Vendor shall meet a performance requirement. The Performance requirements will be generated once we choose the platforms.
16. The OWS Vendor shall provide a means of representing the hierarchical nature of inventory (the ECS concepts or collection and version)
17. The W*S services provided by the OWS Vendor shall recognize when the HDF-EOS source file has already been converted to GeoTIFF during the session and not invoke another conversion.
18. The OWS Vendor shall provide a caching mechanism for the 'efficient' management of requests requiring on-the-fly conversion.
19. The W*S services provided by the OWS Vendor shall recognize when the HDF-EOS source file has been pre-converted to GeoTIFF and not invoke a conversion.
20. The OWS Vendor shall provide an API to allow DOWS to propagate OWS metadata to the W*S indexer.
21. The OWS Vendor shall allow the custom addition and removal of arbitrary WCS metadata, exposed by a DescribeCoverage request via an API.

22. The OWS Vendor shall allow the custom addition and removal of arbitrary WMS metadata, exposed by a DescribeLayer request, via an API.

4. Data Publishing

The OGC paradigm for discovery of data is 'publish, find and bind'.

The 'publish' aspect of this paradigm will be achieved by the 'data publishing' operational thread.

All OWS-enabled data, that has been successfully exposed, will have its metadata exported to the ECHO system. An OGC client (The Earth Science Gateway web client will be our target client) will be able to search for data offered by our WMS and WCS via interrogation of an OGC catalogue service associated with ECHO.

The specification of this catalogue service is described in ticket OG_S5_07 (OGC Interface to ECHO).

In order to populate ECHO with the relevant service information the following must be implemented:

i. The Data Pool database will need to support new parameters that indicate

   a. What inventory is to be offered by the WMS and/or WCS.
   b. What inventory has been successfully exposed via the W*S services.

ii. The BMGT utility will have to be modified to export relevant OWS information as part of the collection and granule level metadata to ECHO. The requirements for these modifications are covered in ticket BE_S5_01 (BMGT Export to ECHO).

The execution, synchronization and failure recovery of these operational threads will be determined by design.

High Level Architecture
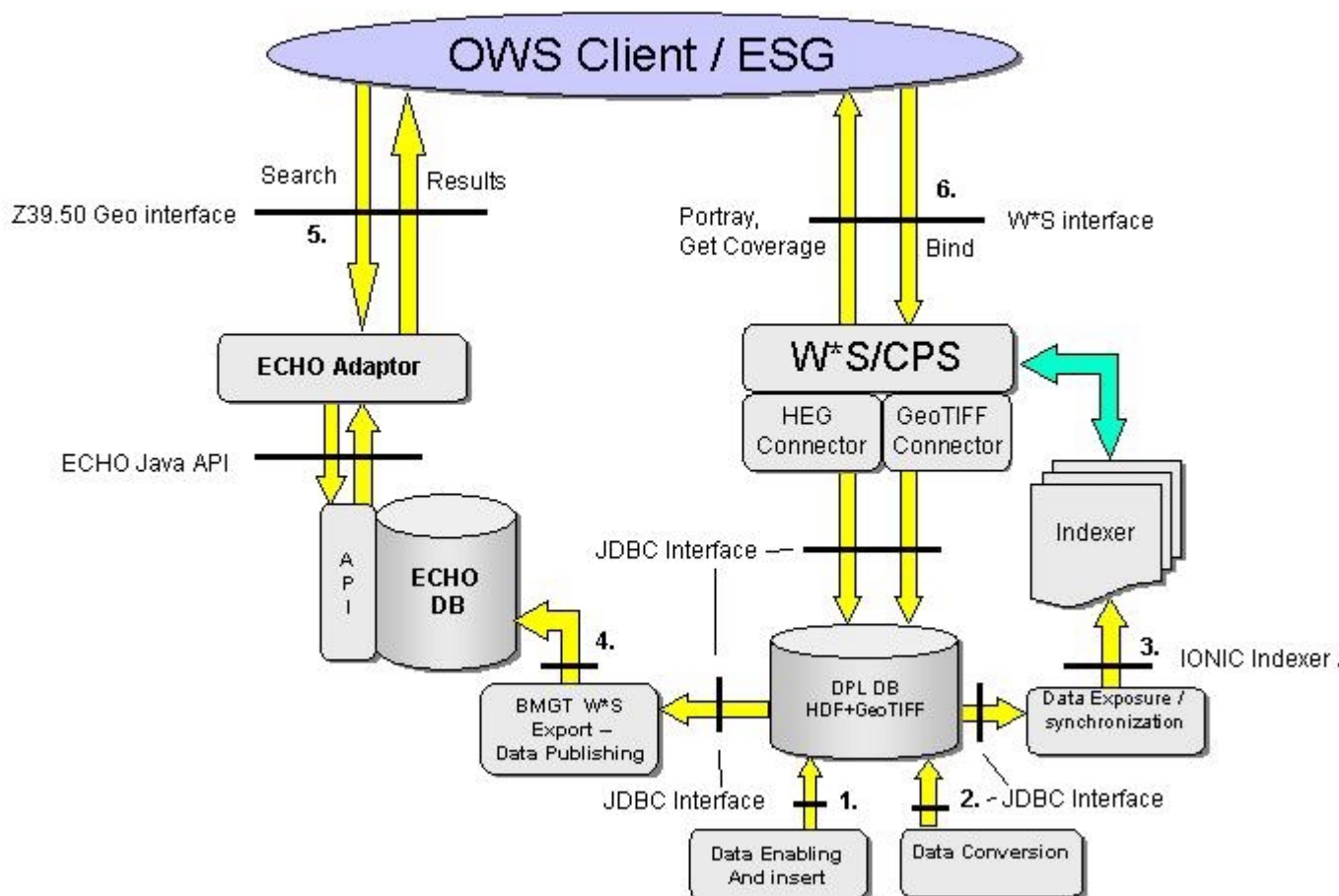
Figure 1 – High Level Architecture

Figure 1 depicts the high level architecture for this ticket. The flow of events associated with publishing, finding and binding to OWS-enabled data is described below,

1. OWS-enabled data is inserted into the Datapool database.

2. OWS-enabled data tagged for pre-conversion to GeoTIFF is converted. This process is triggered by scheduling rather than insert. The DAAC will be responsible for managing how many granules are pre-converted.

3. A subset of the metadata associated with the OWS-enabled data is propagated to the Indexer. This process is triggered by scheduling rather than insert. That data is now visible as WCS and/or WMS services to the ESG.

4. A subset of the metadata associated with the OWS-enabled data, along with its' service information, is exported to ECHO via the BMGT W*S Export capability. This process is triggered by scheduling rather than insert. Once the metadata is ingested by ECHO this data is now 'discoverable' via the ESG. This procedure fulfills the 'publish' aspect of the architecture.

5. The ESG queries the ECHO holdings via the OGC Catalogue service provided by the OGC - ECHO Adaptor. This allows the end-user to find services of interest. This procedure fulfills the 'find' aspect of the architecture.

6. The ESG invokes mapping and/or coverage services residing at the Data Pool based on information gained from step 5. This procedure, along with steps 1-3, fulfills the 'bind' aspect of the architecture. Invocation of these services presents coverage and/or mapping data to the end-user. Note that the W*S will only perform conversion to GeoTIFF where necessary. Pre-converted data will be used where appropriate.

Operational Impact

1. Data Enabling

The DAACs will need to initially choose, create, configure and subsequently maintain the sets of data that they want to expose via the WMS and the WCS. These sets will map to OWS themes which describe, in the case of WCS, a coverage offering, and in the case of WMS, a layer.

2. Data Conversion and Exposure

The DAACs will need to configure this combined activity to run at regular intervals (daily is assumed).

The DAACs will need to maintain the operations of the third Party W*S applications.

The DAACs will need to manage the amount of OWS inventory they wish to pre-convert to GeoTIFF.

3. Data Publishing

The DAACs will need to configure this activity to run at regular intervals (daily is assumed). Ideally, this will run after and with the same frequency as Data Conversion / Exposure.

A critical assumption for operational impact is that two new platforms are going to be delivered to support the OWS capabilities; one to host and run all HEG pre-conversion operations (note that on-the-fly conversions will occur on the W*S host) and another (with a scalable configuration) to host and run all OWS servers and supporting custom code. In this way, the additional demand on DPL resources can be served.

It is expected that the platform to host HEG operations will be delivered, configured and put into operations months before the DOWS delivery.

Transition Approach

It is expected that the following transition activities may need to take place:

1. The Data Pool database drilldown capability will need to be modified to differentiate between OWS and drilldown themes.
2. The DAACs may decide to convert data that is already residing in the Data Pool to GeoTIFF format such that it can be offered up through the W*S servers.
3. The DAACs may decide on performing other operations on data before offering them via the W*S services available.

Comments:
1. Expansion of external references section

1. ESG, the Earth Science Gateway Portal, developed by Compusult, an Open Geospatial Consortium (OGC) compliant client.
2. ECHO, the EOSDIS Clearing House, developed by GST.

External Specifications

The following specifications will be followed for the development of DOWS,

- OGC OWS Common Implementation Specification Version 0.20
- OGC Web Coverage Services (WCS) Version 1.0
- OGC Web Mapping Services (WMS) Version 1.1.1
- OGC Catalogue Services Version 1.1.1 (see ticket OG_S5_07 (OGC Interface to ECHO))
- OGC WMS-SLD Version 1.0.0
- The Z39.50 protocol Version 3 (see ticket OG_S5_07 (OGC Interface to ECHO))
- Z39.50 Application Profile for Geospatial Metadata or 'GEO' Version 2.2 (see ticket OG_S5_07 (OGC Interface to ECHO))
- The ECHO Application Programming Interface Version 6.0 (see ticket OG_S5_07 (OGC Interface to ECHO))

The following Interoperability Program Report-Engineering Specification will be followed for the development of DOWS,

- OGC Coverage Portrayal Service (CPS) 0.0.2

Level 3 Requirement(s):

NONE

IRD Requirement(s):

NONE

Level 4 Requirement(s):

L4 ID	L4 Text	Release	CCR Num	Criteria ID
S-OWS-01720	The DOWS shall support version 1.0 of the 'Open Geospatial Consortium Web Coverage Services' specification. http://www.opengeospatial.org/specs/?page=baseline s document 'Web Coverage Service' Version 1.0 (03-065r6) dated 2003-10-16with the following exceptions: a. The WCS shall, at a minimum, support WGS 84 coordinate reference system. b. Of the above, the WCS shall, at a minimum, support those projections supported by the HEG tool. c. c) The WCS shall, at a minimum, support GeoTIFF and HDF-EOS formats on input and output.	SY5	04-0492	60, 65, 110, 120, 130, 140, 150
S-OWS-01730	The DOWS shall support version 1.1.1 of the 'Open Geospatial Consortium (OGC) Mapping Services' specification. http://www.opengeospatial.org/specs/?page=baseline document 'Web Mapping Service' Version 1.1.1 (01-068r2) dated 2001-12-07	SY5	04-0492	60, 65, 70, 75, 80, 90, 100
S-OWS-01740	The DOWS shall support a Coverage Portrayal Service (CPS) that conforms to the OGC CPS Discussion Paper. http://www.opengeospatial.org/specs/?page=baseline document 'Coverage Portrayal Service' (02-019r) dated 2002-02-28	SY5	04-0492	60, 65, 70, 75, 80, 90, 100

S-OWS-01745	The DOWS shall support a WMS+SLD service that conforms to version 1.0.0 of the OGC SLD specification.	SY5	04-0492	60, 65, 70, 75, 80, 90, 100
S-OWS-01750	The DOWS shall provide OWS access for up to 10 new Earth Science Data Types. 1. MOD13A2 2. MYD13A2 3. MOD13Q1 4. MYD13Q1 5. MOD13A1 6. MYD13A1 7. MOD11A1 8. MYD11A1 9. MOD09A1 10. MYD09A1	SY5	04-0492	220
S-OWS-01770	The DOWS shall be able to store and manage up to 50000 pieces of inventory via OWS. [Note : the definition of an individual piece of inventory is the collection of GeoTIFFs created from a single hdf-eos granule]	SY5	04-0492	210
S-OWS-01780	The OWS Vendor shall support the following services on supported data types and as supported by HEG: a. Format conversion b. Spatial subsetting c. Varying output resolution d. Re-projections contained in WGS84	SY5	04-0664	230
S-OWS-01830	The DOWS shall support the conversion to GeoTIFF of 16 bit HDF-EOS data.	SY5	04-0664	220
S-OWS-01860	The DOWS shall provide a system that will be operationally stable whilst inserting and deleting granules and/or geoTIFFs at a rate of at least 5000 daily	SY5	04-0584	240
S-	The DOWS shall provide a system that will provide	SY5	04-	200

OWS-01870	client visibility to new inventory at a rate of 5 updates per second		0492	
S-OWS-01900	The Data Pool Maintenance GUI shall allow the 'full access' operator to create references to arbitrary groups of granules belonging to the same ECS Earth Science Data Type (ESDT) suitable for OGC web services. Those groupings will be referred to as OWS themes.	SY5	05-0021	10, 15, 20, 30
S-OWS-01910	The Data Pool Maintenance GUI shall allow the 'full access' operator to associate an OWS theme with a WMS layer.	SY5	05-0021	10, 15
S-OWS-01915	The DOWS shall associate a granule that belongs to a WMS theme with a unique WMS layer.	SY5	04-0492	130
S-OWS-01920	The DOWS shall allow the operator to associate an OWS theme with a WCS coverage offering.	SY5	04-0492	20
S-OWS-01925	The DOWS shall associate a granule that belongs to a WCS theme with a unique WCS coverage.	SY5	04-0492	80
S-OWS-01930	The Data Pool Maintenance GUI shall allow the 'full access' operator to specify whether an OWS theme's associated granules should be pre-converted to GeoTIFF files.	SY5	05-0021	40, 50, 55

S-OWS-01940	The Spatial Subscription GUI shall allow the 'full access' operator to define OWS enabled data via a number of metadata constraints, such that only newly-inserted inventory, that corresponds to those constraints, is enabled. Those constraints may consist of one or more of the following,
	
	   a. Spatial
	   b. Temporal
	   c. Collection
		SY5	05-0021	50, 55, 80, 90, 100, 130, 140, 150

S-OWS-01950	The DOWS shall allow the 'full access' operator to add OWS themes to the system.	SY5	04-0492	10, 15, 20, 30

S-OWS-01970	The DOWS Data Conversion Utility shall automatically convert HDF-EOS granules that,
	
	    a. Are inventory desired for OWS. This is defined as inventory that has been inserted during a specified time constraint.
	    b. Belong to an OWS theme that is marked for pre-conversion.
	
	The conversion will be to one or more GeoTIFF files.
		SY5	04-0492	50, 55

S-OWS-01980	The DOWS Data Conversion Utility shall place the GeoTIFF files in a location configurable by a 'full access' operator ~~the same directory as their associated HDF-EOS files~~ if the datapool has sufficient space within the cache to accommodate this action. ~~[Note: TBD by design,~~ If there is insufficient space the GeoTIFFs will not be created and the synchronization utility will be informed.~~]~~ [Note: The Conversion Utility will leverage existing datapool functionality to determine this]	SY5	04-0492	50, 55
S-OWS-01990	The DOWS Data Conversion Utility shall register the generated GeoTIFF files in the Data Pool Database as 'children' of the originating HDF-EOS granule.	SY5	04-0492	50, 55
S-OWS-01995	The DOWS Data Conversion Utility shall add GeoTIFFs to the Data Pool inventory in a manner that will allow existing Data Pool clean up capabilities to remove them when their parent inventory is removed.	SY5	04-0492	180, 190
S-OWS-01997	The Data Pool Cleanup Utility shall support the maintenance of the DOWS directories.	SY5	04-0492	190, 270
S-OWS-02000	The DOWS Data Conversion Utility shall only produce GeoTIFF files that are defined by the operator for the specific ESDT the HDF-EOS file belongs to.	SY5	04-0492	50, 55
S-OWS-02015	The DOWS Data Conversion Utility shall allow operators to specify a time range as an input parameter. This time range defines the bounds of desired OWS inventory based on Data Pool insert time.	SY5	04-0492	50, 55

S-OWS-02020	The DOWS Data Conversion Utility shall run in 'previous' time mode such that it will run over a previous unit of time (e.g., year, month, day, hour, minute) with respect to the current time. This time range defines the bounds of desired OWS inventory based on Data Pool insert time.	SY5	04-0492	160
S-OWS-02030	The DOWS Data Conversion Utility shall allow operators to specify a time range at a granularity of one minute.	SY5	04-0492	160
S-OWS-02040	The DOWS Inventory Synchronization Utility shall propagate OWS metadata to the W*S indexer via an API.	SY5	04-0492	60, 65
S-OWS-02060	The DOWS Inventory Synchronization Utility shall allow operators to specify a time range as an input parameter. This time range defines the bounds of desired OWS inventory based on Data Pool insert time.	SY5	04-0492	60, 65
S-OWS-02070	The DOWS Inventory Synchronization Utility shall run in 'previous' time mode such that it will run over a previous unit of time (e.g., year, month, day, hour, minute) with respect to the current time. This time range defines the bounds of desired OWS inventory based on Data Pool insert time.	SY5	04-0492	170
S-OWS-02080	The DOWS Inventory Synchronization Utility shall allow operators to specify a time range at a granularity of one minute.	SY5	04-0492	170
S-OWS-02090	The DOWS Inventory Synchronization Utility shall only propagate metadata that obeys the following constraints, a) Desired OWS inventory validated by a supplied time range. AND b) Inventory that belongs to an OWS theme.	SY5	04-0492	60, 65
S-OWS-02120	The DOWS shall allow the custom addition and removal of arbitrary WCS metadata, exposed by a DescribeCoverage request, for WCS inventory exported	SY5	04-0492	20

	to the indexer.			
S-OWS-02130	The DOWS Inventory Synchronization Utility shall allow the custom addition and removal of arbitrary WMS metadata, exposed by a DescribeLayer request, for WMS inventory exported to the indexer.	SY5	04-0492	10, 15
S-OWS-02135	The DOWS Inventory Synchronization Utility shall label, within the Data Pool database, all inventory that has been successfully synchronized	SY5	04-0492	60, 65

L4 to L3 Mappings:

NONE

L4 to IRD Mappings:

NONE

Design Directive(s):

The DOWS should be a suite of java application. This is because of the following reasons,

1. The third party W*S APIs will be in java.
2. Re-usable elements within other aspects of this effort will be written in java.
3. Sybase database interaction necessary for the Inventory Synchronization Utility is well-supported by java.

The DOWS should split its functionality into the following components,

1. OWS Data enabling.
2. OWS Data pre-conversion.
3. OWS Data exposure.
4. OWS Data publishing. The service URLs exported from Data Pool to ECHO will be W*S service URLs.

This decoupling allows us to partition our operations in terms of the OGC paradigm of 'publish, find, bind'.

As a consequence, the synchronization of these operational threads is crucial to the success of the capability. The means of this synchronization will be determined in the preliminary design phase.

Whether the requirements for data enabling (S-OWS-01900, 01910, 01915, 01920, 01925, 01930, 01940, 01950) will be satisfied by the DOWS or the Data Pool Maintenance GUI components will be determined during Preliminary Design.

Criteria:

Criteria Key	Criteria ID	Criteria Text	Type	CCR Num	L4 ID
3126	10	Add 2 OWS themes, • WmsThemeConverted • WmsThemeUnconverted Such that they are only available via a WMS and have been enabled, via configuration, for the following searchable metadata, • ECS id. • Cloud cover Verify that, a. The Data Pool database is updated specifying that those themes should be made available via a WMS b. The searchable metadata is described in configuration.	FC	05-0021	S-OWS-01900, S-OWS-01910, S-OWS-01950, S-OWS-02130

3127	15	Add 1 OWS theme, • WmsThemeConverted Such that they are only available via a WMS and have been enabled, via configuration, for the following searchable metadata, • ECS id. • Cloud cover Verify that, (a) An error is reported indicating that WmsThemeConverted already exists.	EC	04-0664	S-OWS-01900, S-OWS-01910, S-OWS-01950, S-OWS-02130
3128	20	Add 2 OWS themes (other than those used in criteria 10), • WcsThemeA • WcsThemeB such that they are only available via a WCS and are enabled for the following searchable metadata, • ECS id. • Cloud cover Verify that, a. The Data Pool database is updated specifying that those themes should be made available via a WCS b. The searchable metadata is described configuration.	FC	05-0021	S-OWS-01900, S-OWS-01920, S-OWS-01950, S-OWS-02120
3129	30	Add 2 OWS themes (other than those used in criteria 10 and 20), • combinedThemeA • combinedThemeB	FC	04-0492	S-OWS-01900, S-OWS-01950

		such that they are available both via a WMS and WCS Verify that, a. the Data Pool database is updated specifying that those themes should be made available via a WMS and WCS			
3130	40	Configure the theme 'WmsThemeConverted' to be subject to pre-conversion to GeoTIFF. Verify that, a. the Data Pool database is updated specifying that granules associated with this theme will be subject to pre-conversion to GeoTIFF.	FC	04-0492	S-OWS-01930

3131	50	Configure the OWS specific ESDT associated with WmsThemeConverted such that only 1 GeoTiff will be created during an OWS Data Conversion.
		
		Insert a first set of granules (granule set a) into the Data Pool, and include granules whose associated themes are
		
		    a. Not configured as being accessible via either the WMS or WCS (A non-OWS theme) – 2 granules.
		    b. Configured as being accessible via the WMS only – 1 granule for WmsThemeConverted and 1 granule for WmsThemeUnconverted.
		    c. Configured as being accessible via the WCS only – 1 granule for WcsThemeA and 1 granule for WcsThemeB.
		    d. Configured as being accessible via both the WMS and WCS – 1 granule for CombinedThemeA and 1 granule
			FC	04-0492	S-OWS-01930, S-OWS-01940, S-OWS-01970, S-OWS-01980, S-OWS-01990, S-OWS-02000, S-OWS-02015

for CombinedThemeB.

Note the insertion time and duration.

Wait a period of time sufficient to be able to distinguish this set of data temporally (e.g. 5 minutes), insert a second set of granules (granule set b) that include analogous data to that listed above in a) through d)

Run the Data Conversion Utility, specifying a time range that encompasses the insert time of the granule set (a) that you inserted into the Data Pool (therefore not including the second set of data inserted)

Verify that for the first set of data,

e. GeoTIFF files were created for all granules associated with the theme WmsThemeConverted
f. For each granule associated with WmsThemeConverted, only DAAC-specified GeoTIFFs were created.
g. That each GeoTIFF created exists in the Data Pool database schema and is associated with its' parent granule (the hdf-eos file).
h. GeoTIFF files were created in the directory configured for their dataset same directory as their associated HDF-EOS files
i. No GeoTIFF files were created for granules associated with themes,
   o WmsThemeUnconverted
   o WcsThemeA
   o WcsThemeB
   o CombinedThemeA
   o CombinedThemeB
   o The non-OWS theme.
j. No GeoTIFF files were created for granules configured for being accessible via a WCS only

		Also, verify that No GeoTIFF files were created for any of the data inserted in the granule set (b) of data (outside of the time range) Note that later criteria will use granule sets (a) and (b) for verification steps.			
3132	55	Run the Data Conversion Utility, specifying a time range that does not encompass the insert time of the granule set (a) or granule set (b). Verify that, (a) The utility reports an error indicating that no granules were found for conversion.	EC	04-0492	S-OWS-01930, S-OWS-01940, S-OWS-01970, S-OWS-01980, S-OWS-01990, S-OWS-02000, S-OWS-02015
3133	60	Run the Inventory Synchronization Utility, specifying a time range that encompasses the insert time of granule set a(not including granule set b) Note that the verification of criteria 60-150 are for data inserted in set a (see criterion 50), unless criteria 170 is being validated. Verify that, a) That each piece of inventory in the set a (see criterion 50) is correctly specified as synchronized in the Data Pool database. Using a web browser, issue a WMS GetCapabilities request. Verify that, b) The response is conformant with the GetCapabilities response defined in the document OGC Web Mapping Services	FC	04-0492	S-OWS-01720, S-OWS-01730, S-OWS-01740, S-OWS-01745, S-OWS-02040, S-OWS-02060, S-OWS-02090, S-OWS-02135

		(WMS) 1.1.1 and correctly describes each layer. c) the following layers are correctly reported, - WmsThemeConverted - WmsThemeUnconverted - CombinedThemeA - CombinedThemeB Issue a WCS GetCapabilities request Verify that, d) The response is conformant with the GetCapabilities response defined in the document OGC Web Coverage Services (WCS) Version 1.0 and correctly describes the service. e) The following coverages are correctly reported, - WcsThemeA - WcsThemeB - CombinedThemeA - CombinedThemeB f) The invocation of either a WCS or WMS GetCapabilities request yields no information for the non-OWS theme.			
3134	65	Run the Inventory Synchronization Utility, specifying a time range that does not encompass the insert time of granule set a or granule set b Verify that, (a) The utility reports an error indicating that no granules were found for synchronization.	EC	04-0664	S-OWS-01720, S-OWS-01730, S-OWS-01740, S-OWS-01745, S-OWS-02040, S-OWS-02060, S-OWS-02090, S-OWS-

					02135
3135	70	Using a web browser, issue a WMS GetMap request. For each of the following layers, • WmsThemeConverted • WmsThemeUnconverted • CombinedThemeA • CombinedThemeB Verify that, a. The WmsThemeConverted GetMap invocation returns an image comprising of data from the WmsThemeConverted only. b. The WmsThemeUnconverted GetMap invocation returns an image comprising of data from the WmsThemeUnconverted only. c. The CombinedThemeA GetMap invocation returns an image comprising of only WMS data from the CombinedThemeA. d. The CombinedThemeB GetMap invocation returns an image comprising of only WMS data from the CombinedThemeB. e. Rendering of image data from set b is not returned in any of the above.	FC	04-0492	S-OWS-01730, S-OWS-01740, S-OWS-01745
3136	75	Using a web browser, issue a WMS GetMap request. For the following bogus layer, (a) WmsThemeBogus Verify that, (a) an exception response is delivered to the client.	EC	04-0492	S-OWS-01730, S-OWS-01740, S-OWS-01745
3137	80	Using a web browser, issue a WMS GetMap request for layer associated with WmsThemeUnconverted's granule x where x is the granule id of one of the granules (granule y) associated with	FC	04-0492	S-OWS-01730, S-OWS-01740, S-OWS-

		WmsThemeUnconverted. Verify that, a) The map rendering of granule y is returned only.			01745, S-OWS-01925, S-OWS-01940
3138	90	Using a web browser, issue a WMS GetMap request for layer WmsThemeUnconverted with the following additional constraints a) Bounding box = x Where x is greater than the spatial extent of only one of the granules (granule y) associated with WmsThemeUnconverted. Verify that, b) The map rendering of granule y is returned only.	FC	04-0492	S-OWS-01730, S-OWS-01740, S-OWS-01745, S-OWS-01940
3139	100	Using a web browser, issue a WMS GetMap request for layer WmsThemeUnconverted with the following additional constraints, a) Temporal extent = x Where x is greater than the temporal extent of only one of the granules (granule y) associated with WmsThemeUnconverted. Verify that, b) The map rendering of granule y is returned only.	FC	04-0492	S-OWS-01730, S-OWS-01740, S-OWS-01745, S-OWS-01940
3140	110	Using a web browser, issue a WCS DescribeCoverage request for each of the following coverages, • WcsThemeA • WcsThemeB • CombinedThemeA • CombinedThemeB Verify that a. the response is conformant with the	FC	04-0492	S-OWS-01720

		DescribeCoverage response specification and correctly describes the coverage. b. for the Combined Themes only coverages are described and not the maps associated with the combined theme.			
3141	120	Using a web browser, issue a WCS GetCoverage request for the following coverages, • WcsThemeA • WcsThemeB • CombinedThemeA • CombinedThemeB Verify that a. The WcsThemeA GetCoverage invocation returns all data from the WcsThemeA only. b. The WcsThemeB GetCoverage invocation returns all data from the WcsThemeB only. c. The CombinedThemeA GetCoverage invocation returns only WCS data from the CombinedThemeA. d. The CombinedThemeB GetCoverage invocation returns only WCS data from the CombinedThemeB. e. Data inserted in the second insert run is not returned in any of the above.	FC	04-0492	S-OWS-01720
3142	130	Using a web browser, issue a WCS GetCoverage request for the coverage of WcsThemeA's granule x where x is the granule id of one of the granules (granule y) associated with WcsThemeA. Verify that,	FC	04-0492	S-OWS-01720, S-OWS-01915, S-OWS-01940

		a) The data for granule y is returned only.			
3143	135	Using a web browser, issue a WCS GetCoverage request. For the following bogus layer, (b) WcsThemeBogus Verify that, (a) an exception response is delivered to the client.	EC	04-0492	
3144	140	Using a web browser, issue a WCS GetCoverage request for coverage WcsThemeA with the following additional constraints, • Bounding box = x Where x is greater than the spatial extent of only one of the granules (granule y) associated with WcsThemeA. Verify that, a) The data for granule y is returned only.	FC	04-0492	S-OWS-01720, S-OWS-01940
3145	150	Using a web browser, issue a WCS GetCoverage request for coverage WcsThemeA with the following additional constraints, • Temporal extent = x Where x is greater than the temporal extent of only one of the granules (granule y) associated with WcsThemeA. Verify that, a) The data for granule y is returned only.	FC	04-0492	S-OWS-01720, S-OWS-01940
3146	160	Run the Data Conversion Utility, specifying a 'previous' time range that encompasses the insert time for granule set b (see criterion 50) (not including the set a). Verify that, for granule set b, criteria a)	FC	04-0492	S-OWS-02020, S-OWS-02030

		through f) in criteria 50 are met.			
3147	170	Run the Inventory Synchronization Utility, specifying a 'previous' time range that encompasses the insert time of granule set b (see criterion 50) (not including granule set a). Verify the criteria specified in criteria 60 through 150 for the second set of data.	FC	04-0492	S-OWS-02070, S-OWS-02080
3148	180	Run the Data Pool Cleanup Utility in pre-delete mode such that it will identify granule set (a) (see criterion 50) for deletion. Rerun the Inventory Synchronization Utility with a time constraint that covers the above action. Using criteria 60, 70, 110 and 120 verify that granule set (a) is no longer visible. Using criteria 60, 70, 110 and 120 verify that the granule set (b) is still visible.	FC	04-0492	S-OWS-01995

3149	190	Run the Data Pool Cleanup Utility in finish delete mode and verify that for granule set (a) (see criterion 50).
		
		   a. All GeoTIFF files are removed
		   b. All Data Pool database references to those GeoTIFFs are removed.
			FC	04-0492	S-OWS-01995, S-OWS-01997

3151	200	Configure a single 'WMS only' OWS theme, • WmsBulkThemeA Insert a set of 500 granules into the Data Pool that are associated with the above theme. ~~Run the Data Conversion Utility, specifying a 'previous' time range that encompasses the~~	PC	04-0492	S-OWS-01870

		~~insert time of that set of data only.~~ Run Data Synchronization Utility specifying a 'previous' time range that encompasses the insert time of that set of data only. Verify that this task takes no longer than 100 seconds (the timing activity should begin when the Data Synchronization Utility begins and end on it's completion) and that all 500 granules are visible via a WMS GetMap request using a granule id layer name.			
3152	210	Add a single 'WMS only' OWS theme, • WmsBulkThemeB Insert a set of 50000 granules into the Data Pool that are associated with the above theme. Run the Data Synchronization ~~Conversion~~ Utility, specifying a 'previous' time range that encompasses the insert time of that set of data only. Verify that all 50000 granules are visible via a WMS GetMap request using a granule id layer name.	FC	04-0492	S-OWS-01770
3153	220	Configure 10 'WMS only' OWS themes, • WmsDatasetTheme1 • WmsDatasetTheme2 • Etc Each of these themes corresponds to a single, unique ESDT that is compatible with OWS. Note that the datasets should be, • 16 bit GeoTIFF data Insert a granule into the Data Pool that is associated with each theme. Run the Data Synchronization Utility,	FC	05-0021	S-OWS-01750, S-OWS-01830

		specifying a 'previous' time range that encompasses the insert time of this set of data only.

Verify the criteria specified in 60 through 100 for WMS data are met. | | | |
| 3154 | 230 | Invoke a GetMap request on the WmsThemeConverted layer for each of the following constraints,

   a. Format conversion
   b. Spatial subsetting
   c. Varying output resolution
   d. Re-projections contained in WGS84

Verify that the resultant map for each request corresponds to the constraints supplied. | FC | 04-0664 | S-OWS-01780 |
| 3155 | 240 | Add a single 'WMS only' OWS theme,

   • WmsBulkThemeC

Perform a mixture of insertions and deletions that add up to a set of 5000 granules into the Data Pool that are associated with the above theme.

Run the Data Synchronization Utility, specifying a 'previous' time range that encompasses the insert time of that set of data only.

Verify that this process took no longer than 24 hours.

Verify that all 5000 granules are visible via a WMS GetMap request via the service WmsBulkThemeC. | PC | 04-0492 | S-OWS-01860 |
| 3156 | 270 | Schedule a granule associated with 'WmsThemeConverted' for final delete.

Run the Data Pool Cleanup utility. | FC | 04-0553 | S-OWS-01997 |

| | | Verify that,

a) The hdf-eos granule has been removed from the data pool.

b) The GeoTIFF files associated with the hdf-eos granules have been removed.

Run the DOW Synchronization Utility specifying a time range that will encompass the removal period only.

Verify that,
c) GetMap calls wrt to this inventory return errors conformant with the lack of associated inventory. | | | |

Test Case(s):

NONE